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Transmitted herewith for filing is the Patent Application of:

Inventors: Rene Morales, Jr. and Charles Vaughn Rankin

For: DATA PROCESSING SYSTEM, METHOD, AND PROGRAM FOR AUTOMATICALLY TESTING SOFTWARE APPLICATIONS

Enclosed are:

X Patent Specification and Declaration

X 11 sheets of drawing(s).

X An assignment of the invention to International Business Machines Corporation (includes Recordation Form Cover Sheet).

___ A certified copy of a _____ application.

X Information Disclosure Statement, PTO 1449 and copies of references.

The filing fee has been calculated as shown below:

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DATA PROCESSING SYSTEM, METHOD, AND PROGRAM FOR AUTOMATICALLY TESTING SOFTWARE APPLICATIONS

CROSS-REFERENCE TO RELATED APPLICATIONS

The present invention is related to the subject matter of co-pending patent application serial number ***XXXXX*** (Docket Number AUS000090US1) entitled "DATA PROCESSING SYSTEM, METHOD, AND PROGRAM FOR GENERATING A JOB WITHIN AN AUTOMATED TEST ENVIRONMENT", assigned to the assignee herein named, filed on ***XXXXX***, and incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Technical Field:

The present invention relates in general to data processing systems and, in particular, to a data processing system, method, and program for automatically testing software applications. Still more particularly, the present invention relates to a data processing system, method, and program for automatically testing software applications utilizing an event-driven work flow manager which controls a plurality of ordered test phases executed utilizing a plurality of computers coupled together via a network.

2. Description of the Related Art:

Personal computer systems are well known in the art. They have attained widespread use for providing computer power to many segments of today's modern society.

Personal computers (PCs) may be defined as a desktop, floor standing, or portable microcomputer that includes a system unit having a central processing unit (CPU) and associated volatile and non-volatile memory, including random access memory (RAM) and basic input/output system read only memory (BIOS ROM), a system monitor, a keyboard, one or more flexible diskette drives, a CD-ROM drive, a fixed disk storage drive (also known as a "hard drive"), a pointing device such as a mouse, and an optional network interface adapter. One of the distinguishing characteristics of these systems is the use of a motherboard or system planar to electrically connect these components together. Examples of such personal computer systems are IBM's PC 300 series, and Aptiva series.

An important part of software development is testing whether a particular software application functions as intended and without encountering errors. Typically, a large number of tests will be repeatedly executed on the software application. In order to perform these tests efficiently, a variety of software testing devices have been disclosed. These devices typically describe a testing method to be executed utilizing a single computer system which is also executing the software application being tested. The computer system will include the necessary test cases, any applications needed to execute the test cases, and all other necessary hardware or software components.

A tester who desires to execute the tests must oversee and control the testing environment. The tester

is required to define the test cases, identify the computer system to execute the test cases, indicate to the computer system when a particular portion of the test should start executing, when a portion of the test has completed and when to begin executing the next portion of the test. Although the computer system will automatically execute the tests, the tester must manually control the execution of the tests.

SUMMARY OF THE INVENTION

A data processing system, method, and program including an automated software test environment are disclosed for automatically testing a software application. A work flow manager is established for automatically managing the automated software test environment. The automated software test environment includes multiple computer systems coupled to a server computer system utilizing a network. The work flow manager is executed utilizing the server computer system. Multiple ordered test phases are established. At least each of two of the order test phases are executed utilizing different ones of the computer systems. An event is transmitted to the work flow manager utilizing one of the computer system to start execution of selected ones of the ordered test phases. The work flow manager controls execution of the selected ordered test phases in response to the receipt of events.

All objects, features, and advantages of the present invention will become apparent in the following detailed written description.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself however, as well as a preferred mode of use, further objects and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

Figure 1 depicts an illustrative embodiment of a data processing system with which the present invention may advantageously be utilized;

Figure 2 illustrates a more detailed pictorial representation of the computer system of **Figure 1** in accordance with the present invention;

Figure 3 is a high level block diagram which depicts an automated software test environment in accordance with the present invention;

Figure 4 depicts a high level flow chart which illustrates establishing an automated software test environment including a work flow manager in accordance with the present invention;

Figure 5 illustrates a high level flow chart which depicts an initialization test phase of an automated software test environment in accordance with the present invention;

Figure 6 depicts a high level flow chart which illustrates a generation of INIT and INSTALL events and a work flow manager managing the execution of ordered test phases in accordance with the present invention;

Figure 7 illustrates a high level flow chart which depicts an installation test phase of an automated software test environment in accordance with the present invention;

Figure 8 illustrates a high level flow chart which depicts the execution procedure for all processes executed within an automated software test environment in accordance with the present invention;

Figure 9 depicts a high level flow chart which illustrates a termination phase of an automated software test environment in accordance with the present invention;

Figure 10 illustrates a high level flow chart which depicts a validation procedure for all processes executed within an automated software test environment in accordance with the present invention;

Figure 11 depicts pseudo-code which provides an example of the execution of processes in serial, in parallel, and in a combination of serial and parallel processes in accordance with the present invention; and

Figure 12 illustrates an execution time line depicting the execution of the processes of **Figure 11** in

accordance with the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

A data processing system, method, and program are described for automatically testing software applications. A work flow manager is established for automatically managing the automated software test environment. The automated software test environment includes a plurality of computer systems coupled to a server computer system utilizing a network. The work flow manager is executed utilizing the server computer system.

The work flow manager accepts job definitions, waits for events external to the work flow manager in response to which the work flow manager controls the execution of selected ones of the ordered test phases, executes the jobs based on test machine availability and priority, provides job management facilities for a tester, logs execution results, and notifies testers upon test failure. Once a tester submits a job to the work flow manager, the work flow manager automatically executes the test phases to complete the job. The work flow manager will automatically execute the test phases upon the availability of the test machines. When the job is complete, the work flow manager will report the results to the tester.

The automated software test environment includes a server computer system executing the work flow manager and a plurality of computer systems. The ordered test phases are executed on the computer systems. Preferably, the test phase execution is divided among the computer

systems such that one or more computers will execute a test phase. For example, multiple computer systems may be utilized to build a software application while different, multiple computer systems may be utilized to execute tests.

The work flow manager automatically controls the execution of the plurality of ordered test phases without the need for manual intervention. The test phases include an initialization (INIT) phase, an installation (INSTALL) phase, an execution (EXE) phase, and a termination (TERM) phase.

During the initialization phase, the computer systems which are to be utilized as test machines are prepared to execute the tests. The test machines may be prepared prior to the availability of a built version of the software application to test. Before the initialization phase, the software application that is to be tested is built. During the initialization test phase, it is copied to a public computer system such that the built application may be accessed by the work flow manager. During the installation test phase, the software application to be tested is copied to the test machine(s) which will execute the tests. Additional software routines and data necessary to execute the tests are also copied to the test machines during the installation phase. During the execution test phase, the tests are executed on the software application. The termination test phase, thereafter, resets the test machines to their original states by cleaning up the processes which were executed in order to execute the

tests, collecting test logs, uninstalling applications, deleting files, and re-booting the test machines to their original states. During all phases, the executed processes are validated by a validation procedure described below.

The work flow manager is event driven. For the initialization test phase and the installation test phase, an event is transmitted to the work flow manager from a computer system external to the work flow manager which is executing initialization and installation processes. The work flow manager controls execution of the ordered test phases in response to the receipt of these events.

Figure 1 illustrates a pictorial representation of a data processing system **10** in accordance with the present invention. Computer system **10** includes a computer **12**, a monitor **14**, a keyboard **16**, a mouse **18**, a plotter **20**, a printer **21**, and a floppy drive **22**. Computer system **10** may be implemented utilizing any commercially available computer system which has been suitably programmed and which has been modified as described below. Computer system **10** is capable of receiving a variety of different types of inputs from a variety of different types of input devices. Keyboard **16** and mouse **18** are two such types of input devices.

Figure 2 depicts a more detailed pictorial representation of the computer system of **Figure 1** in accordance with the present invention. Computer system

12 includes a planar (also commonly called a motherboard or system board) which is mounted within computer 12 and provides a means for mounting and electrically interconnecting various components of computer 12 including a central processing unit (CPU) 200, system memory 206, and accessory cards or boards as is well known in the art.

CPU 200 is connected by address, control, and data busses 202 to a memory controller and peripheral component interconnect (PCI) bus bridge 204 which is coupled to system memory 206. An integrated drive electronics (IDE) device controller 220, and a PCI bus to Industry Standard Architecture (ISA) bus bridge 212 are connected to PCI bus bridge 204 utilizing PCI bus 208. IDE controller 220 provides for the attachment of IDE compatible storage devices, such as a removable hard disk drive 222. PCI/ISA bridge 212 provides an interface between PCI bus 208 and an optional feature or expansion bus such as the ISA bus 214. PCI/ISA bridge 212 includes power management logic. PCI/ISA bridge 212 is supplied power from battery 244 to prevent loss of configuration data stored in CMOS 213.

A PCI standard expansion bus with connector slots 210 is coupled to PCI bridge 204. PCI connector slots 210 may receive PCI bus compatible peripheral cards. An ISA standard expansion bus with connector slots 216 is connected to PCI/ISA bridge 212. ISA connector slots 216 may receive ISA compatible adapter cards (not shown). It will be appreciated that other expansion bus types may be

used to permit expansion of the system with added devices. It should also be appreciated that two expansion busses are not required to implement the present invention.

An I/O controller **218** is coupled to PCI-ISA bridge controller **212**. I/O controller **218** controls communication between PCI-ISA bridge controller **212** and devices and peripherals such as keyboard **16**, mouse **18**, and floppy drive **22** so that these devices may communicate with CPU **200**.

PCI-ISA bridge controller **212** includes an interface for a flash memory **242** which includes an interface for address, data, flash chip select, and read/write. Flash memory **242** is an electrically erasable programmable read only memory (EEPROM) module and includes BIOS that is used to interface between the I/O devices and operating system.

Computer **12** includes a video controller **246** which may, for example, be plugged into one of PCI expansion slots **210**. Video controller **246** is connected to video memory **248**. The image in video memory **248** is read by controller **246** and displayed on monitor **14** which is connected to computer **12** through connector **250**.

Computer **12** includes a power supply **240** which supplies full normal system power **243**.

Computer **12** also includes a network adapter **230**.

Network adapter **230** may be plugged into one of the PCI connector slots **210** (as illustrated) or one of the ISA connector slots **216** in order to permit computer **12** to communicate with a network.

Figure 3 is a high level block diagram which depicts an automated software test environment **300** in accordance with the present invention. Automated software test environment **300** includes multiple computer systems, such as depicted in **Figures 1** and **2**, coupled together utilizing a network. Automated software test environment **300** includes a work flow manager **302** which coordinates all aspects of the automated testing of a software application. Work flow manager **302** receives requests **304** from requesting computer systems, i.e. requesting machines **306**. Examples of such requests include a query to return information about a job, a request to hold a job, or a submission of a job definition. An event service **310** generates events **308**, such as INIT events and INSTALL events as described below, to indicate to the work flow manager the start of one of the test phases.

Work flow manager **302** controls operation of multiple process execution machines **312**. Process execution machines **312** include computer systems selected to be test machines **314** (also called "DUTs", device-under-test) executing the software application under test, a file repository **316**, and software distribution servers **318**. File repository **316** stores test case files and other files necessary for test machines **314** to execute the required tests. Software distribution servers **318** are

utilized to store applications which might be needed in test machines **314** in order to execute the tests. The present invention permits the sharing of machines across jobs.

The selection of machines to be used as test machines may be made explicitly by identifying particular machines, or may be made by specifying machine characteristics. For example, a tester might specify a test machine by specifying a processor speed and type, as well as other information. Further, a database might maintain the characteristics for each machine which could be specified as a test machine. Therefore, a database query could be constructed to obtain each machine which has the characteristics specified by the testers.

Work flow manager **302** provides a notification **320** to a notification service **322** in response to the operation of the process execution machines **312**. Notification **320** may be one of several different types of notifications. For example, notification service **322** may be notified that execution of the test cases for the software application under test completed execution, the execution of the test cases for the software application under test did not complete execution, and/or the results of the various test cases did not pass validation.

Figure 4 depicts a high level flow chart which illustrates establishing an automated software test environment including a work flow manager, and establishing a plurality of test phases for each job to be executed by the work flow manager in accordance with

the present invention. The process starts as depicted by block **400** and thereafter passes to block **402** which illustrates establishing a work flow manager. Next, block **402** depicts establishing an initialization (INIT) phase of testing. Thereafter, block **406** depicts establishing an installation (INSTALL) phase of testing. Block **408**, then, illustrates establishing an execution (EXE) phase of testing. Next, block **410** depicts establishing a termination (TERM) phase of testing. Thereafter, block **412** illustrates a determination of whether or not to generate test phases for additional jobs. If a determination is made that test phases for additional jobs should be generated, the process passes back to block **404**. Referring again to block **412**, if a determination is made that test phases for additional jobs are not to be generated, the process terminates as depicted by block **414**.

Figure 5 illustrates a high level flow chart which depicts an initialization phase of an automated software test environment in accordance with the present invention. The process starts as depicted by block **500** and thereafter passes to block **502** which illustrates receiving an initialization event (INIT). The process passes to block **504** which depicts the creation of a job, or jobs, to execute using a job description, priority, and event information. Next, block **506** depicts the work flow manager retrieving information about which test machines are required. The information includes job priority information. Block **508**, then, depicts the work flow manager determining the availability of the required

test machines. The process then passes to block **510** which illustrates the execution of the job, or jobs, having the highest priority for which all of the needed test machines are available. Thereafter, block **512** depicts the installation of the operating system required to execute the automated test as necessary. Thereafter, block **514** depicts the installation of the required applications on the test machines as necessary. For example, these applications may include other software required to test interoperability, or software required to test whether the application under test can coexist with other software.

The process then passes to block **516** which illustrates the installation of necessary test tools on the test machines. Next, block **518** depicts the execution of any other required initialization phase processes. Thereafter, block **520** illustrates a determination of whether or not all initialization processes described above with reference to **Figure 5** and any other initialization processes have been completed. If a determination is made that not all initialization processes have been completed, the process passes back to block **520**. Referring again to block **520**, if a determination is made that all initialization processes have been completed, the process passes to block **522** which illustrates a generation of an INSTALL event. The process then terminates as depicted by block **524**.

Figure 6 depicts a high level flow chart which illustrates a generation of INIT and INSTALL events and a

work flow manager managing the execution of ordered test phases in accordance with the present invention. The process starts as depicted by block **600** and thereafter passes to block **602** which illustrates the building of a software application. The process then passes to block **604** which depicts a determination of whether or not the build process for this software application under test has been completed. If a determination is made that the build process for this software application under test has not been completed, the process passes back to block **602**. A software application is ready to be built once the code for the application is written and the code is ready to be compiled. Referring again to block **604**, if a determination is made that the build process for this software application under test has been completed, the process passes simultaneously to both block **606** and block **610**. In this manner, the work flow manager is capable of executing initialization processes, such as test machine set up, while the software to be tested is being built and propagated to public computer systems.

Block **606** depicts a determination of whether or not the built version of the software application has been copied to a public computer system. If a determination is made that the built version of the software application has not been copied to a public computer system, the process passes back to block **606**. Referring again to block **606**, if a determination is made that the built version of the software application has been copied to a public computer system, the process passes to block **608** which illustrates the generation of an INSTALL event

to the work flow manager.

Block **610** illustrates the generation of an INIT event to the work flow manager. Next, block **612** depicts the work flow manager (WFM) executing the INIT event phase processes as defined in the job description. Thereafter, block **614** illustrates a determination of whether or not an INSTALL event was received by the work flow manager. If a determination is made that an INSTALL event was not received, the process passes back to block **614**. Referring again to block **614**, if a determination is made that an INSTALL event was received by the work flow manager, the process passes to block **616** which depicts the work flow manager executing the INSTALL test phase processes as defined by the job description. Thereafter, block **618** illustrates the work flow manager executing the execution (EXE) test phase processes as defined by the job description. Next, block **620** illustrates the work flow manager executing the termination (TERM) test phase processes as defined by the job description. The process then terminates as depicted by block **622**.

Figure 7 illustrates a high level flow chart which depicts an installation phase of an automated software test environment in accordance with the present invention. The process starts as depicted by block **700** and thereafter passes to block **702** which illustrates a determination of whether or not the work flow manager has received both an INIT event and an INSTALL event for the software application under test. If a determination is made that the work flow manager has not received both of

these events for the software application under test, the process passes back to block **702**.

Referring again to block **702**, if a determination is made that the work flow manager has received both the INIT and INSTALL events for the software application under test, the process passes to block **704** which depicts the work flow manager installing the software application to be tested on the computer system(s) selected to be the test machine(s). Next, block **706** illustrates the installation of the additional tools and test cases. The test cases are either custom built routines and/or generally available test applications used to test the software application. The process then passes to block **708** which depicts a determination of whether or not the installation phase for the software application has been completed. If a determination is made that installation phase for the software application has not been completed, the process passes back to block **704**. Referring again to block **708**, if a determination is made that installation phase for the software application has been completed, the process passes to block **710** which illustrates the work flow manager being ready for the execution test phase. The process then terminates as depicted by block **712**.

Figure 8 illustrates a high level flow chart which depicts the execution procedure for all processes executed within an automated software test environment in accordance with the present invention. The process starts as depicted by block **800** and thereafter passes to

block **802** which illustrates a determination of whether or not the work flow manager has completed execution of the previous test phase. If a determination is made that the work flow manager has not completed execution of the previous phase, the process passes back to block **802**. Referring again to block **802**, if a determination is made that the work flow manager has completed execution of the previous phase, the process passes to block **804** which depicts the work flow manager executing processes as defined by the job or jobs. Thereafter, block **806** illustrates performing a validation process on all of the completed processes. Next, block **808** depicts a determination of whether or not each of the completed processes passed the validation process. For each of the completed processes, if a determination is made that the process passed the validation process, the process passes to block **810** which illustrates the execution of the termination processes for each of the completed processes. For each process, one or more termination processes will be executed when the process has been completed in order to reset the test machines to an original state.

Thereafter, block **812** depicts a determination of whether or not there are any processes left executing. If a determination is made that there are more processes executing, the process passes back to block **804**. Referring again to block **812**, if a determination is made that no more processes are executing, the process passes to block **814** which depicts the work flow manager being ready for the next test phase, if any.

Referring again to block **808**, for each of the completed processes, if a determination is made that the process did not pass validation, the process passes to block **816** which illustrates a determination of whether or not to log the test process failure and continue processing the job. If a determination is made to log the test process failure and continue processing the job, the process passes to block **818** which depicts logging the test process failure. The process then passes to block **810**.

Referring again to block **816**, if a determination is made not to log the test process failure and continue processing the job, the process passes to block **820** which depicts a determination of whether or not to hold the job and notify the tester of the failure. If a determination is made to hold the job and notify the tester of the failure, the process passes to block **822** which illustrates holding the job and notifying the tester. Next, block **824** depicts a determination of whether or not the user has terminated this test process. If a determination is made that the user terminated the test process, the process passes to block **826** which illustrates the work flow manager executing the termination phase, i.e. the "DUT TERM" phase, for the device-under test (DUT) test machine. The "DUT TERM" phase is executed after the currently executing processes have been terminated, either by the work flow manager or by the tester. Referring again to block **824**, if a determination is made that the user did not terminate the test process, the process passes to block **810**.

Referring again to block **820**, if a determination is made not to hold the job and notify the tester, the process passes to block **828** which illustrates a determination of whether or not to terminate the job. If a determination is made to terminate the job, the process passes to block **830** which depicts terminating the job and notifying the tester. The process then passes to block **826**.

Referring again to block **828**, if a determination is made not to terminate the job, the process passes to block **832** which illustrates executing a custom routine. The process then passes back to block **810**.

Figure 9 illustrates a high level flow chart which depicts a termination phase of an automated software test environment in accordance with the present invention. The process starts as depicted by block **900** and thereafter passes to block **902** which illustrates a determination of whether or not the execution test phase has completed or the job was terminated. If a determination is made that either the execution test phase has not completed or the job has not terminated, the process passes back to block **902**. Referring again to block **902**, if a determination is made that either the execution test phase has completed or the job was terminated, the process passes to block **904** which depicts the work flow manager performing clean-up processes. Next, block **906** depicts the work flow manager collecting test logs as necessary. Block **908**, then, illustrates the work flow manager uninstalling processes from test

machines as necessary. The process then passes to block **910** which depicts the work flow manager deleting all unnecessary files from the test machines. Thereafter, block **912** illustrates the work flow manager re-booting the test machines to other operating systems as necessary. Next, block **914** depicts the execution of any other termination process. The process then terminates as depicted by block **916**.

Figure 10 depicts a high level flow chart which illustrates a validation procedure for all processes executed within an automated software test environment in accordance with the present invention. The process starts as depicted by block **1000** and thereafter passes to block **1002** which illustrates obtaining the return code for a process which has completed execution. Next, block **1004** illustrates a determination of whether or not the return code validation procedure should be executed. If a determination is made that the return code validation procedure should not be executed, the process passes to block **1006** which depicts a determination of whether or not a separate validation process should be spawned. If a determination is made that a separate validation process should not be spawned, the process passes to block **1008** which depicts a selection of a do-not-validate option. Therefore, the process will not be validated. The process passes to block **1022** which illustrates the process passing validation. The process then terminates as depicted by block **1024**.

Referring again to block **1004**, if a determination is

made that the return code validation procedure should be executed, the process passes to block **1012** which depicts a comparison of the expected return code with the actual return code. Next, block **1014** illustrates a determination of whether or not the expected and actual return codes are the same. If a determination is made that the expected and actual return codes are not the same, the process passes to block **1016** which depicts a determination that the process failed the validation process. Referring again to block **1014**, if a determination is made that the expected and actual return codes are the same, the process passes to block **1022** which depicts a determination that the process passed the validation process. The process then terminates as illustrated by block **1024**.

Referring again to block **1006**, if a determination is made that a separate process should be spawned, the process passes to block **1018** which depicts spawning a new process. The spawned process itself will be validated utilizing the process described by **Figure 10**. Next, block **1020** illustrates a determination of whether or not the process passed validation utilizing the spawned process. If a determination is made that the process did not pass validation using the spawned process, the process passes to block **1016** which depicts a determination that the process failed the validation process. The process then terminates as illustrated by block **1024**. Referring again to block **1020**, if a determination is made that the process did pass validation using the spawned process, the process passes

to block **1022** which depicts a determination that the process passed the validation process.

Figure 11 depicts pseudo-code which provides an example of the execution of processes in serial, in parallel, and in a combination of serial and parallel processes in accordance with the present invention. **Figure 12** illustrates an execution time line depicting the execution of the processes of **Figure 11** in accordance with the present invention.

A process for installing an operating system "INSTALLOS" is first started. Then, a process group is executed. A process group is a grouping of processes and/or other process groups. Process groups also include execution information that indicates whether to run the group in parallel or series.

The INSTALLOS process executes and completes first, and then the RUNTESTS process group executes. The RUNTESTS process group includes the RUNXYZTEST process and the RUNABC process group. The RUNXYZTEST process and the RUNABC process group are executed in parallel.

The RUNABC process group includes two processes which are the RUNABCTEST and the CLEANUPABCFILES processes. The RUNABCTEST and the CLEANUPABCFILES processes are executed in series. Once all of the RUNTESTS group's processes complete execution, the COLLECTLOGS process is executed.

While the invention has been particularly shown and

described with reference to a preferred embodiment, it will be understood by those skilled in the art that various changes in form and detail may be made therein without departing from the spirit and scope of the invention.

CLAIMS

What is claimed is:

1. A method in a data processing system including an automated software test environment for automatically testing a software application, said method comprising the steps of:

establishing a work flow manager for automatically managing said automated software test environment, said automated software test environment including a plurality of computer systems coupled to a server computer system utilizing a network, said work flow manager being executed utilizing said server computer system;

establishing a plurality of ordered test phases to be executed in a specified order;

transmitting an event to said work flow manager utilizing one of said plurality of computer systems to start execution of selected ones of said plurality of ordered test phases; and

controlling execution of said selected ones of said plurality of ordered test phases utilizing said work flow manager in response to a receipt of events.

2. The method according to claim 1, further comprising the step of executing an initialization test phase utilizing said work flow manager in response to a receipt of a build event by said server computer system, said

build event being generated by one of said plurality of computer systems utilized to build said software application.

3. The method according to claim 1, further comprising the steps of:

said step of establishing a plurality of ordered test phases further comprising the step of establishing a plurality of ordered test phases including an execution test phase for executing a plurality of tests on said software application; and

executing a first plurality of said plurality of tests in series.

4. The method according to claim 1, further comprising the steps of:

said step of establishing a plurality of ordered test phases further comprising the step of establishing a plurality of ordered test phases including an execution test phase for executing a plurality of tests on said software application; and

executing a second plurality of said plurality of tests in parallel.

5. The method according to claim 1, further comprising the steps of:

said step of establishing a plurality of ordered

test phases further comprising the step of establishing a plurality of ordered test phases including an execution test phase for executing a plurality of tests on said software application;

executing a first plurality of said plurality of tests in series; and

executing said first plurality of said plurality of tests in parallel with a fourth plurality of said plurality of tests.

6. The method according to claim 1, further comprising the step of receiving a job description utilizing said work flow manager, said job description including an identification of said software application and an identification of a plurality of tests to be executed on said software application.

7. The method according to claim 1, wherein the step of establishing a plurality of ordered test phases further comprises the step of establishing an initialization test phase for preparing said test environment for testing said software application, said initialization test phase capable of being executed prior to an availability of said software application.

8. The method according to claim 1, wherein the step of establishing a plurality of ordered test phases further comprises the step of establishing an installation test phase for installing test processes and said software

application on said plurality of computer systems.

9. The method according to claim 1, wherein the step of establishing a plurality of ordered test phases further comprises the steps of:

establishing an execution test phase for executing a plurality of tests on said software application; and

establishing a termination test phase for terminating said execution of said tests.

10. The method according to claim 1, further comprising the step of specifying an order for executing said plurality of ordered test phases including specifying completing execution of an initialization test phase prior to executing an installation test phase, completing execution of said installation test phase prior to executing an execution test phase, and completing execution of said execution test phase prior to executing a termination test phase.

11. The method according to claim 7, further comprising the step of during said initialization test phase prior to said software application being available, preparing said automated test environment to execute said plurality of tests.

12. The method according to claim 7, further comprising the step of generating an initialization event in response to a completion of building said software

application.

13. The method according to claim 7, wherein said step of prior to said availability of said software application, preparing said automated test environment to execute said plurality of tests further comprises the step of determining an availability of one of said plurality of computer system to be utilized to execute one of said plurality of tests.

14. The method according to claim 7, wherein said step of establishing an initialization test phase further comprises the step of establishing an initialization test phase including the steps of:

executing initialization test phase processes;

building said software application; and

copying said built software application to one of said plurality of computer systems, wherein said software application is available when said built software application is copied to one of said plurality of computer systems.

15. The method according to claim 14, further comprising the step of generating an installation event in response to a completion of said copying said built software application to one of said plurality of computer systems and a completion of initialization test phase processes.

16. The method according to claim 8, wherein said step of establishing an installation test phase further comprises the step of establishing an installation test phase including the step of installing a plurality of test cases on one of said plurality of computer systems.

17. The method according to claim 8, wherein said step of establishing an installation test phase further comprises the step of installing an operating system required to execute one of said plurality of tests on one of said plurality of computer systems.

18. The method according to claim 8, wherein said step of establishing an installation test phase further comprises the step of installing a plurality of test tools required to execute one of said plurality of tests on one of said plurality of computer systems.

19. The method according to claim 9, wherein said step of establishing an execution test phase further comprises the step of establishing an execution test phase including the step of executing said plurality of tests.

20. The method according to claim 9, wherein said step of establishing a termination test phase further comprises the step of establishing a termination test phase including the step of resetting said automated test environment to an original state.

21. The method according to claim 1, further comprising the step of establishing a validation procedure including the steps of:

suspending execution of said plurality of tests prior to a completion of said plurality of tests; and

providing a notification of said suspension.

22. The method according to claim 1, further comprising the step of establishing a validation procedure including the steps of:

terminating execution of said plurality of tests prior to a completion of said plurality of tests; and

providing a notification of said termination.

23. The method according to claim 1, further comprising the step of establishing a validation procedure including the steps of:

executing a process to determine a result of an execution of each said plurality of tests; and

reporting said result.

24. The method according to claim 1, wherein said step of establishing a plurality of ordered test phases further comprises the step of establishing a plurality of ordered test phases, at least each of two of said plurality of order test phases being executed utilizing different ones of said plurality of computer systems.

25. A method in a data processing system including an automated software test environment for automatically

testing a software application utilizing a plurality of tests, said method comprising the steps of:

establishing a work flow manager for automatically managing said automated software test environment, said automated software test environment including a plurality of computer systems coupled to a server computer system utilizing a network, said work flow manager being executed utilizing said server computer system;

building said software application utilizing one of said plurality of computer systems to create a build version of said software application;

automatically transmitting an initialization event to said work flow manager utilizing said one of said plurality of computer systems to start execution of an initialization test phase in response to a completion of said build version of said software application.

26. The method according to claim 25, further comprising the step of during said step of building said software application, preparing said automated test environment to execute a plurality of tests on said software application.

27. A method in a data processing system including an automated software test environment for automatically testing a software application utilizing a plurality of tests, said method comprising the steps of:

establishing a work flow manager for automatically

managing said automated software test environment, said automated software test environment including a plurality of computer systems coupled to a server computer system utilizing a network, said work flow manager being executed utilizing said server computer system;

building said software application utilizing a build computer system to create a build version of said software application;

copying said build version of said software application from said build computer system to one of said plurality of computer systems; and

automatically transmitting an installation event to said work flow manager utilizing said build computer system to start execution of an installation test phase in response to said copying of said build version to said one of said plurality of computer systems.

28. The method according to claim 27, further comprising the step of installing a plurality of test cases on one of said plurality of computer systems in response to a receipt of said installation event.

29. The method according to claim 27, further comprising the step of installing an operating system required to execute one of said plurality of tests on one of said plurality of computer systems in response to a receipt of said installation event.

30. The method according to claim 27, further comprising the step of installing a plurality of test tools required to execute one of said plurality of tests on one of said plurality of computer systems in response to a receipt of said installation event.

31. A method in a data processing system including an automated software test environment for automatically testing a software application, said method comprising the steps of:

establishing an event-driven work flow manager for automatically managing said automated software test environment in response to a receipt of events, said automated software test environment including a plurality of computer systems coupled to a server computer system utilizing a network, said work flow manager being executed utilizing said server computer system;

executing a plurality of tests on said software application utilizing said plurality of computer systems being managed by said work flow manager;

in response to a completion of one of said plurality of tests, executing a validation procedure to validate a result of said one of said plurality of tests;

suspending execution of others of said plurality of tests being executed in response to a failure of said validation procedure to validate said result of said one of said plurality of tests; and

providing a notification of said suspension of execution.

32. A method in a data processing system including an automated software test environment for automatically testing a software application, said method comprising the steps of:

establishing an event-driven work flow manager for automatically managing said automated software test environment in response to a receipt of events, said automated software test environment including a plurality of computer systems coupled to a server computer system utilizing a network, said work flow manager being executed utilizing said server computer system;

executing a plurality of tests on said software application utilizing said plurality of computer systems being managed by said work flow manager;

in response to a completion of one of said plurality of tests, executing a validation procedure to validate a result of said one of said plurality of tests;

terminating execution of others of said plurality of tests being executed in response to a failure of said validation procedure to validate said result of said one of said plurality of tests; and

providing a notification of said termination of execution.

33. A method in a data processing system including an automated software test environment for automatically testing a software application, said method comprising the steps of:

establishing an event-driven work flow manager for automatically managing said automated software test environment in response to a receipt of events, said automated software test environment including a plurality of computer systems coupled to a server computer system utilizing a network, said work flow manager being executed utilizing said server computer system;

executing a plurality of tests on said software application utilizing said plurality of computer systems being managed by said work flow manager;

in response to a completion of one of said plurality of tests, executing a validation procedure to validate a result of said one of said plurality of tests;

spawning a new process in response to said execution of a validation procedure to determine a result of execution of said one of said plurality of tests; and

reporting a result of said spawned new process, wherein said result of execution of said one of said plurality of tests is reported.

34. A data processing system including an automated software test environment for automatically testing a software application, said data processing system

comprising:

means for establishing a work flow manager for automatically managing said automated software test environment, said automated software test environment including a plurality of computer systems coupled to a server computer system utilizing a network, said work flow manager being executed utilizing said server computer system;

means for establishing a plurality of ordered test phases to be executed in a specified order;

means for transmitting an event to said work flow manager utilizing one of said plurality of computer systems to start execution of selected ones of said plurality of ordered test phases; and

means for controlling execution of said selected ones of said plurality of ordered test phases utilizing said work flow manager in response to a receipt of events.

35. The system according to claim 34, further comprising means for executing an initialization test phase utilizing said work flow manager in response to a receipt of a build event by said server computer system, said build event being generated by one of said plurality of computer systems utilized to build said software application.

36. The system according to claim 34, further comprising:

said means for establishing a plurality of ordered test phases further comprising means for establishing a plurality of ordered test phases including an execution test phase for executing a plurality of tests on said software application; and

means for executing a first plurality of said plurality of tests in series.

37. The system according to claim 34, further comprising:

said means for establishing a plurality of ordered test phases further comprising means for establishing a plurality of ordered test phases including an execution test phase for executing a plurality of tests on said software application; and

means for executing a second plurality of said plurality of tests in parallel.

38. The system according to claim 34, further comprising:

said means for establishing a plurality of ordered test phases further comprising means for establishing a plurality of ordered test phases including an execution test phase for executing a plurality of tests on said software application;

means for executing a first plurality of said plurality of tests in series; and

means for executing said first plurality of said plurality of tests in parallel with a fourth plurality of said plurality of tests.

39. The system according to claim 34, further comprising means for receiving a job description utilizing said work flow manager, said job description including an identification of said software application and an identification of a plurality of tests to be executed on said software application.

40. The system according to claim 34, wherein said means for establishing a plurality of ordered test phases further comprises means for establishing an initialization test phase for preparing said test environment for testing said software application, said initialization test phase capable of being executed prior to an availability of said software application.

41. The system according to claim 34, wherein said means for establishing a plurality of ordered test phases further comprises means for establishing an installation test phase for installing test processes and said software application on said plurality of computer systems.

42. The system according to claim 34, wherein said means for establishing a plurality of ordered test phases further comprises:

means for establishing an execution test phase for executing a plurality of tests on said software application; and

means for establishing a termination test phase for terminating said execution of said tests.

43. The system according to claim 34, further comprising means for specifying an order for executing said plurality of ordered test phases including specifying completing execution of an initialization test phase prior to executing an installation test phase, completing execution of said installation test phase prior to executing an execution test phase, and completing execution of said execution test phase prior to executing a termination test phase.

44. The system according to claim 40, further comprising means during said initialization test phase prior to said software application being available, for preparing said automated test environment to execute said plurality of tests.

45. The system according to claim 40, further comprising means for generating an initialization event in response to a completion of building said software application.

46. The system according to claim 40, wherein said means prior to said availability of said software application, for preparing said automated test environment to execute said plurality of tests further comprises means for determining an availability of one of said plurality of

computer system to be utilized to execute one of said plurality of tests.

47. The system according to claim 40, wherein said means for establishing an initialization test phase further comprises means for establishing an initialization test phase including:

means for executing initialization test phase processes;

means for building said software application; and

means for copying said built software application to one of said plurality of computer systems, wherein said software application is available when said built software application is copied to one of said plurality of computer systems.

48. The system according to claim 47, further comprising means for generating an installation event in response to a completion of said copying said built software application to one of said plurality of computer systems and a completion of initialization test phase processes.

49. The system according to claim 41, wherein said means for establishing an installation test phase further comprises means for establishing an installation test phase including means for installing a plurality of test cases on one of said plurality of computer systems.

50. The system according to claim 41, wherein said means for establishing an installation test phase further comprises means for installing an operating system required to execute one of said plurality of tests on one of said plurality of computer systems.

51. The system according to claim 41, wherein said means for establishing an installation test phase further comprises means for installing a plurality of test tools required to execute one of said plurality of tests on one of said plurality of computer systems.

52. The system according to claim 42, wherein said means for establishing an execution test phase further comprises means for establishing an execution test phase including means for executing said plurality of tests.

53. The system according to claim 42, wherein said means for establishing a termination test phase further comprises means for establishing a termination test phase including means for resetting said automated test environment to an original state.

54. The system according to claim 34, further comprising means for establishing a validation procedure including:

means for suspending execution of said plurality of tests prior to a completion of said plurality of tests; and

means for providing a notification of said suspension.

55. The system according to claim 34, further comprising means for establishing a validation procedure including:

means for terminating execution of said plurality of tests prior to a completion of said plurality of tests; and

means for providing a notification of said termination.

56. The system according to claim 34, further comprising means for establishing a validation procedure including:

means for executing a process to determine a result of an execution of each said plurality of tests; and

means for reporting said result.

57. The system according to claim 34, wherein said means for establishing a plurality of ordered test phases further comprises means for establishing a plurality of ordered test phases, at least each of two of said plurality of order test phases being executed utilizing different ones of said plurality of computer systems.

58. A data processing system including an automated software test environment for automatically testing a software application utilizing a plurality of tests, comprising:

means for establishing a work flow manager for

automatically managing said automated software test environment, said automated software test environment including a plurality of computer systems coupled to a server computer system utilizing a network, said work flow manager being executed utilizing said server computer system;

means for building said software application utilizing one of said plurality of computer systems to create a build version of said software application;

means for automatically transmitting an initialization event to said work flow manager utilizing said one of said plurality of computer systems to start execution of an initialization test phase in response to a completion of said build version of said software application.

59. The system according to claim 58, further comprising means during said means for building said software application, for preparing said automated test environment to execute a plurality of tests on said software application.

60. A data processing system including an automated software test environment for automatically testing a software application utilizing a plurality of tests, comprising:

means for establishing a work flow manager for automatically managing said automated software test environment, said automated software test environment

including a plurality of computer systems coupled to a server computer system utilizing a network, said work flow manager being executed utilizing said server computer system;

means for building said software application utilizing a build computer system to create a build version of said software application;

means for copying said build version of said software application from said build computer system to one of said plurality of computer systems; and

means for automatically transmitting an installation event to said work flow manager utilizing said build computer system to start execution of an installation test phase in response to said copying of said build version to said one of said plurality of computer systems.

61. The system according to claim 60, further comprising means for installing a plurality of test cases on one of said plurality of computer systems in response to a receipt of said installation event.

62. The system according to claim 60, further comprising means for installing an operating system required to execute one of said plurality of tests on one of said plurality of computer systems in response to a receipt of said installation event.

63. The system according to claim 60, further comprising means for installing a plurality of test tools required to execute one of said plurality of tests on one of said plurality of computer systems in response to a receipt of said installation event.

64. A data processing system including an automated software test environment for automatically testing a software application, comprising:

means for establishing an event-driven work flow manager for automatically managing said automated software test environment in response to a receipt of events, said automated software test environment including a plurality of computer systems coupled to a server computer system utilizing a network, said work flow manager being executed utilizing said server computer system;

means for executing a plurality of tests on said software application utilizing said plurality of computer systems being managed by said work flow manager;

means responsive to a completion of one of said plurality of tests, for executing a validation procedure to validate a result of said one of said plurality of tests;

means for suspending execution of others of said plurality of tests being executed in response to a failure of said validation procedure to validate said result of said one of said plurality of tests; and

means for providing a notification of said suspension of execution.

65. A data processing system including an automated software test environment for automatically testing a software application, comprising:

means for establishing an event-driven work flow manager for automatically managing said automated software test environment in response to a receipt of events, said automated software test environment including a plurality of computer systems coupled to a server computer system utilizing a network, said work flow manager being executed utilizing said server computer system;

means for executing a plurality of tests on said software application utilizing said plurality of computer systems being managed by said work flow manager;

means responsive to a completion of one of said plurality of tests, for executing a validation procedure to validate a result of said one of said plurality of tests;

means for terminating execution of others of said plurality of tests being executed in response to a failure of said validation procedure to validate said result of said one of said plurality of tests; and

means for providing a notification of said termination of execution.

66. A data processing system including an automated software test environment for automatically testing a software application, comprising:

means for establishing an event-driven work flow manager for automatically managing said automated software test environment in response to a receipt of events, said automated software test environment including a plurality of computer systems coupled to a server computer system utilizing a network, said work flow manager being executed utilizing said server computer system;

means for executing a plurality of tests on said software application utilizing said plurality of computer systems being managed by said work flow manager;

means responsive to a completion of one of said plurality of tests, for executing a validation procedure to validate a result of said one of said plurality of tests;

means for spawning a new process in response to said execution of a validation procedure to determine a result of execution of said one of said plurality of tests; and

means for reporting a result of said spawned new process, wherein said result of execution of said one of said plurality of tests is reported.

67. A computer program product including an automated software test environment for automatically testing a software application, said computer program product comprising:

instruction means for establishing a work flow manager for automatically managing said automated software test environment, said automated software test environment including a plurality of computer systems coupled to a server computer system utilizing a network, said work flow manager being executed utilizing said server computer system;

instruction means for establishing a plurality of ordered test phases to be executed in a specified order;

instruction means for transmitting an event to said work flow manager utilizing one of said plurality of computer systems to start execution of selected ones of said plurality of ordered test phases; and

instruction means for controlling execution of said selected ones of said plurality of ordered test phases utilizing said work flow manager in response to a receipt of events.

68. The computer program product according to claim 67, further comprising instruction means for executing an initialization test phase utilizing said work flow manager in response to a receipt of a build event by said server computer system, said build event being generated by one of said plurality of computer systems utilized to

build said software application.

69. The computer program product according to claim 67, further comprising:

said instruction means for establishing a plurality of ordered test phases further comprising instruction means for establishing a plurality of ordered test phases including an execution test phase for executing a plurality of tests on said software application; and

instruction means for executing a first plurality of said plurality of tests in series.

70. The computer program product according to claim 67, further comprising:

said instruction means for establishing a plurality of ordered test phases further comprising instruction means for establishing a plurality of ordered test phases including an execution test phase for executing a plurality of tests on said software application; and

instruction means for executing a second plurality of said plurality of tests in parallel.

71. The computer program product according to claim 67, further comprising:

said instruction means for establishing a plurality of ordered test phases further comprising instruction means for establishing a plurality of ordered test phases

including an execution test phase for executing a plurality of tests on said software application;

instruction means for executing a first plurality of said plurality of tests in series; and

instruction means for executing said first plurality of said plurality of tests in parallel with a fourth plurality of said plurality of tests.

72. The computer program product according to claim 67, further comprising instruction means for receiving a job description utilizing said work flow manager, said job description including an identification of said software application and an identification of a plurality of tests to be executed on said software application.

73. The computer program product according to claim 67, wherein said instruction means for establishing a plurality of ordered test phases further comprises instruction means for establishing an initialization test phase for preparing said test environment for testing said software application, said initialization test phase capable of being executed prior to an availability of said software application.

74. The computer program product according to claim 67, wherein said instruction means for establishing a plurality of ordered test phases further comprises instruction means for establishing an installation test phase for installing test processes and said software application on said plurality of computer systems.

75. The computer program product according to claim 67, wherein said instruction means for establishing a plurality of ordered test phases further comprises:

instruction means for establishing an execution test phase for executing a plurality of tests on said software application; and

instruction means for establishing a termination test phase for terminating said execution of said tests.

76. The computer program product according to claim 67, further comprising instruction means for specifying an order for executing said plurality of ordered test phases including specifying completing execution of an initialization test phase prior to executing an installation test phase, completing execution of said installation test phase prior to executing an execution test phase, and completing execution of said execution test phase prior to executing a termination test phase.

77. The computer program product according to claim 73, further comprising instruction means during said initialization test phase prior to said software application being available, for preparing said automated test environment to execute said plurality of tests.

78. The computer program product according to claim 73, further comprising instruction means for generating an initialization event in response to a completion of building said software application.

79. The computer program product according to claim 73, wherein said instruction means prior to said availability of said software application, for preparing said automated test environment to execute said plurality of tests further comprises instruction means for determining an availability of one of said plurality of computer system to be utilized to execute one of said plurality of tests.

80. The computer program product according to claim 73, wherein said instruction means for establishing an initialization test phase further comprises instruction means for establishing an initialization test phase including:

instruction means for executing initialization test phase processes;

instruction means for building said software application; and

instruction means for copying said built software application to one of said plurality of computer systems, wherein said software application is available when said built software application is copied to one of said plurality of computer systems.

81. The computer program product according to claim 80, further comprising instruction means for generating an installation event in response to a completion of said copying said built software application to one of said

plurality of computer systems and a completion of initialization test phase processes.

82. The computer program product according to claim 74, wherein said instruction means for establishing an installation test phase further comprises instruction means for establishing an installation test phase including instruction means for installing a plurality of test cases on one of said plurality of computer systems.

83. The computer program product according to claim 74, wherein said instruction means for establishing an installation test phase further comprises instruction means for installing an operating system required to execute one of said plurality of tests on one of said plurality of computer systems.

84. The computer program product according to claim 74, wherein said instruction means for establishing an installation test phase further comprises instruction means for installing a plurality of test tools required to execute one of said plurality of tests on one of said plurality of computer systems.

85. The computer program product according to claim 75, wherein said instruction means for establishing an execution test phase further comprises instruction means for establishing an execution test phase including instruction means for executing said plurality of tests.

86. The computer program product according to claim 75, wherein said instruction means for establishing a

termination test phase further comprises instruction means for establishing a termination test phase including instruction means for resetting said automated test environment to an original state.

87. The computer program product according to claim 67, further comprising instruction means for establishing a validation procedure including:

instruction means for suspending execution of said plurality of tests prior to a completion of said plurality of tests; and

instruction means for providing a notification of said suspension.

88. The computer program product according to claim 67, further comprising instruction means for establishing a validation procedure including:

instruction means for terminating execution of said plurality of tests prior to a completion of said plurality of tests; and

instruction means for providing a notification of said termination.

89. The computer program product according to claim 67, further comprising instruction means for establishing a validation procedure including:

instruction means for executing a process to

determine a result of an execution of each said plurality of tests; and

instruction means for reporting said result.

90. The computer program product according to claim 67, wherein said instruction means for establishing a plurality of ordered test phases further comprises instruction means for establishing a plurality of ordered test phases, at least each of two of said plurality of order test phases being executed utilizing different ones of said plurality of computer systems.

91. A computer program product including an automated software test environment for automatically testing a software application utilizing a plurality of tests, comprising:

instruction means for establishing a work flow manager for automatically managing said automated software test environment, said automated software test environment including a plurality of computer systems coupled to a server computer system utilizing a network, said work flow manager being executed utilizing said server computer system;

instruction means for building said software application utilizing one of said plurality of computer systems to create a build version of said software application;

instruction means for automatically transmitting an

initialization event to said work flow manager utilizing said one of said plurality of computer systems to start execution of an initialization test phase in response to a completion of said build version of said software application.

92. The computer program product according to claim 91, further comprising instruction means during said instruction means for building said software application, for preparing said automated test environment to execute a plurality of tests on said software application.

93. A computer program product including an automated software test environment for automatically testing a software application utilizing a plurality of tests, comprising:

instruction means for establishing a work flow manager for automatically managing said automated software test environment, said automated software test environment including a plurality of computer systems coupled to a server computer system utilizing a network, said work flow manager being executed utilizing said server computer system;

instruction means for building said software application utilizing a build computer system to create a build version of said software application;

instruction means for copying said build version of said software application from said build computer system to one of said plurality of computer systems; and

instruction means for automatically transmitting an installation event to said work flow manager utilizing said build computer system to start execution of an installation test phase in response to said copying of said build version to said one of said plurality of computer systems.

94. The computer program product according to claim 93, further comprising instruction means for installing a plurality of test cases on one of said plurality of computer systems in response to a receipt of said installation event.

95. The computer program product according to claim 93, further comprising instruction means for installing an operating system required to execute one of said plurality of tests on one of said plurality of computer systems in response to a receipt of said installation event.

96. The computer program product according to claim 93, further comprising instruction means for installing a plurality of test tools required to execute one of said plurality of tests on one of said plurality of computer systems in response to a receipt of said installation event.

97. A computer program product including an automated software test environment for automatically testing a software application, comprising:

instruction means for establishing an event-driven

work flow manager for automatically managing said automated software test environment in response to a receipt of events, said automated software test environment including a plurality of computer systems coupled to a server computer system utilizing a network, said work flow manager being executed utilizing said server computer system;

instruction means for executing a plurality of tests on said software application utilizing said plurality of computer systems being managed by said work flow manager;

instruction means responsive to a completion of one of said plurality of tests, for executing a validation procedure to validate a result of said one of said plurality of tests;

instruction means for suspending execution of others of said plurality of tests being executed in response to a failure of said validation procedure to validate said result of said one of said plurality of tests; and

instruction means for providing a notification of said suspension of execution.

98. A computer program product including an automated software test environment for automatically testing a software application, comprising:

instruction means for establishing an event-driven work flow manager for automatically managing said automated software test environment in response to a

receipt of events, said automated software test environment including a plurality of computer systems coupled to a server computer system utilizing a network, said work flow manager being executed utilizing said server computer system;

instruction means for executing a plurality of tests on said software application utilizing said plurality of computer systems being managed by said work flow manager;

instruction means responsive to a completion of one of said plurality of tests, for executing a validation procedure to validate a result of said one of said plurality of tests;

instruction means for terminating execution of others of said plurality of tests being executed in response to a failure of said validation procedure to validate said result of said one of said plurality of tests; and

instruction means for providing a notification of said termination of execution.

99. A computer program product including an automated software test environment for automatically testing a software application, comprising:

instruction means for establishing an event-driven work flow manager for automatically managing said automated software test environment in response to a receipt of events, said automated software test

environment including a plurality of computer systems coupled to a server computer system utilizing a network, said work flow manager being executed utilizing said server computer system;

instruction means for executing a plurality of tests on said software application utilizing said plurality of computer systems being managed by said work flow manager;

instruction means responsive to a completion of one of said plurality of tests, for executing a validation procedure to validate a result of said one of said plurality of tests;

instruction means for spawning a new process in response to said execution of a validation procedure to determine a result of execution of said one of said plurality of tests; and

instruction means for reporting a result of said spawned new process, wherein said result of execution of said one of said plurality of tests is reported.

ABSTRACT OF THE DISCLOSURE

DATA PROCESSING SYSTEM, METHOD, AND PROGRAM FOR AUTOMATICALLY TESTING SOFTWARE APPLICATIONS

A data processing system, method, and program including an automated software test environment are disclosed for automatically testing a software application. A work flow manager is established for automatically managing the automated software test environment. The automated software test environment includes multiple computer systems coupled to a server computer system utilizing a network. The work flow manager is executed utilizing the server computer system. Multiple ordered test phases are established. At least each of two of the order test phases are executed utilizing different ones of the computer systems. An event is transmitted to the work flow manager utilizing one of the computer systems to start execution of selected ones of the ordered test phases. The work flow manager controls execution of the selected ordered test phases in response to the receipt of events.

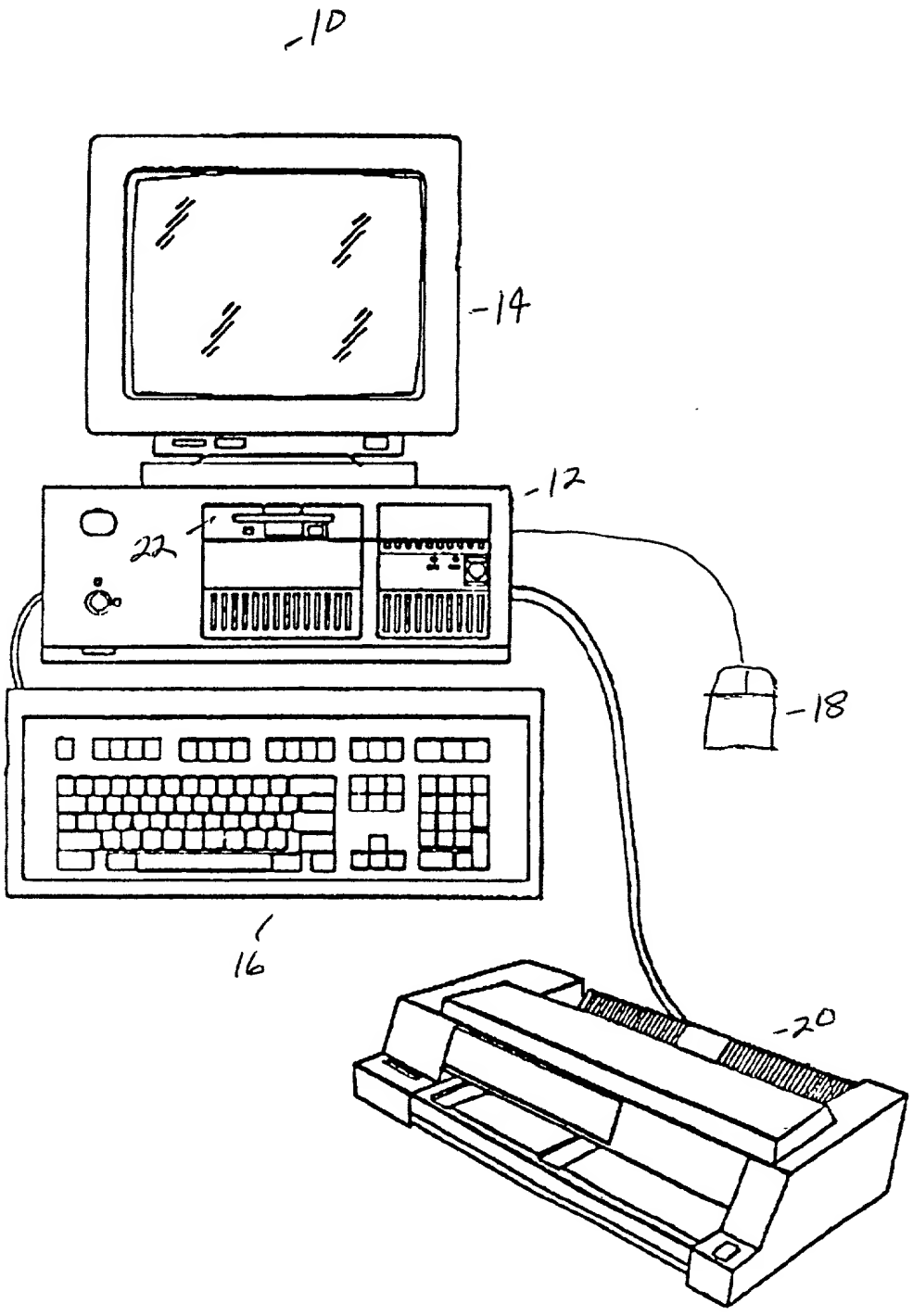

Fig. 1

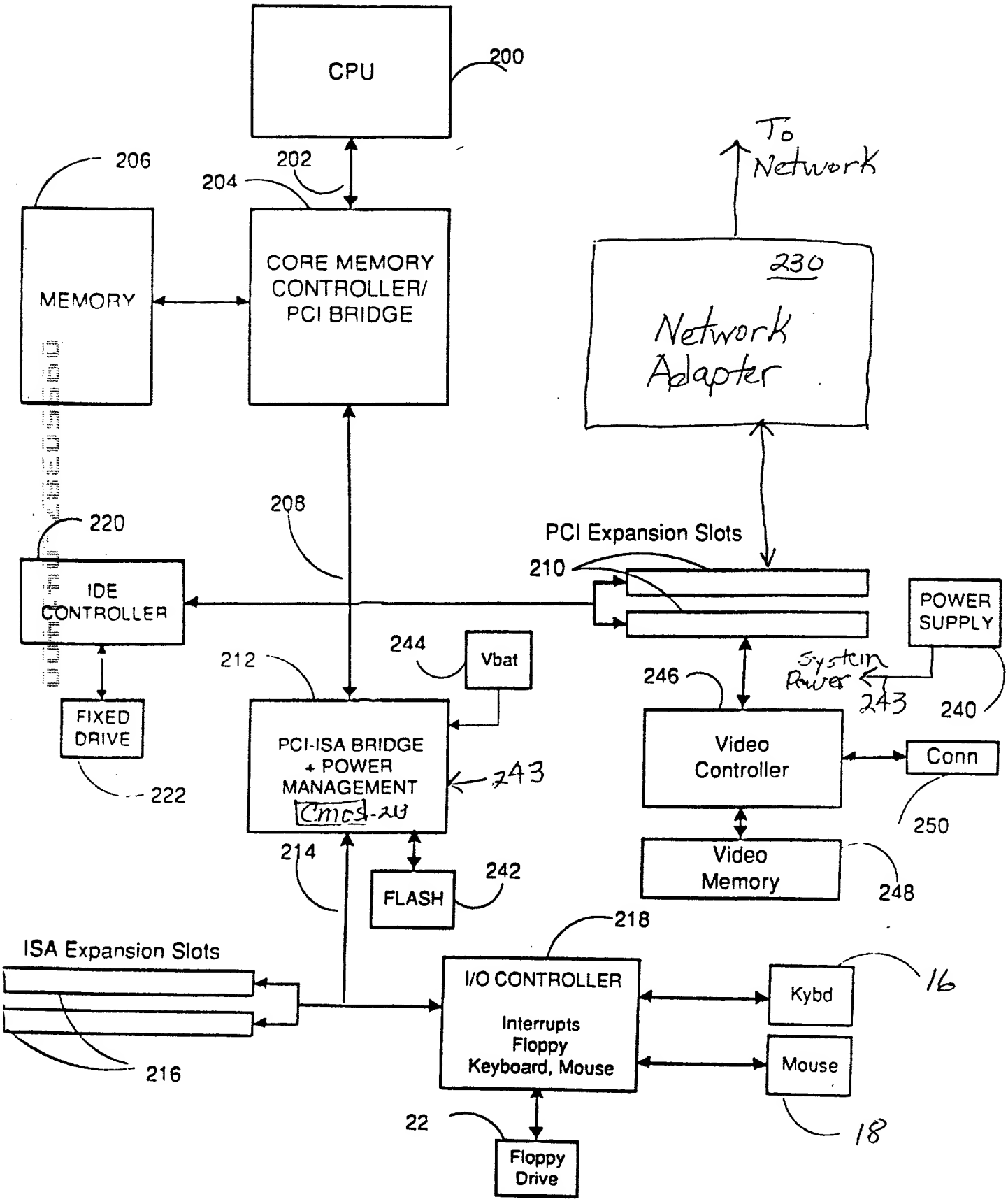

Fig. 2

AUS000091451

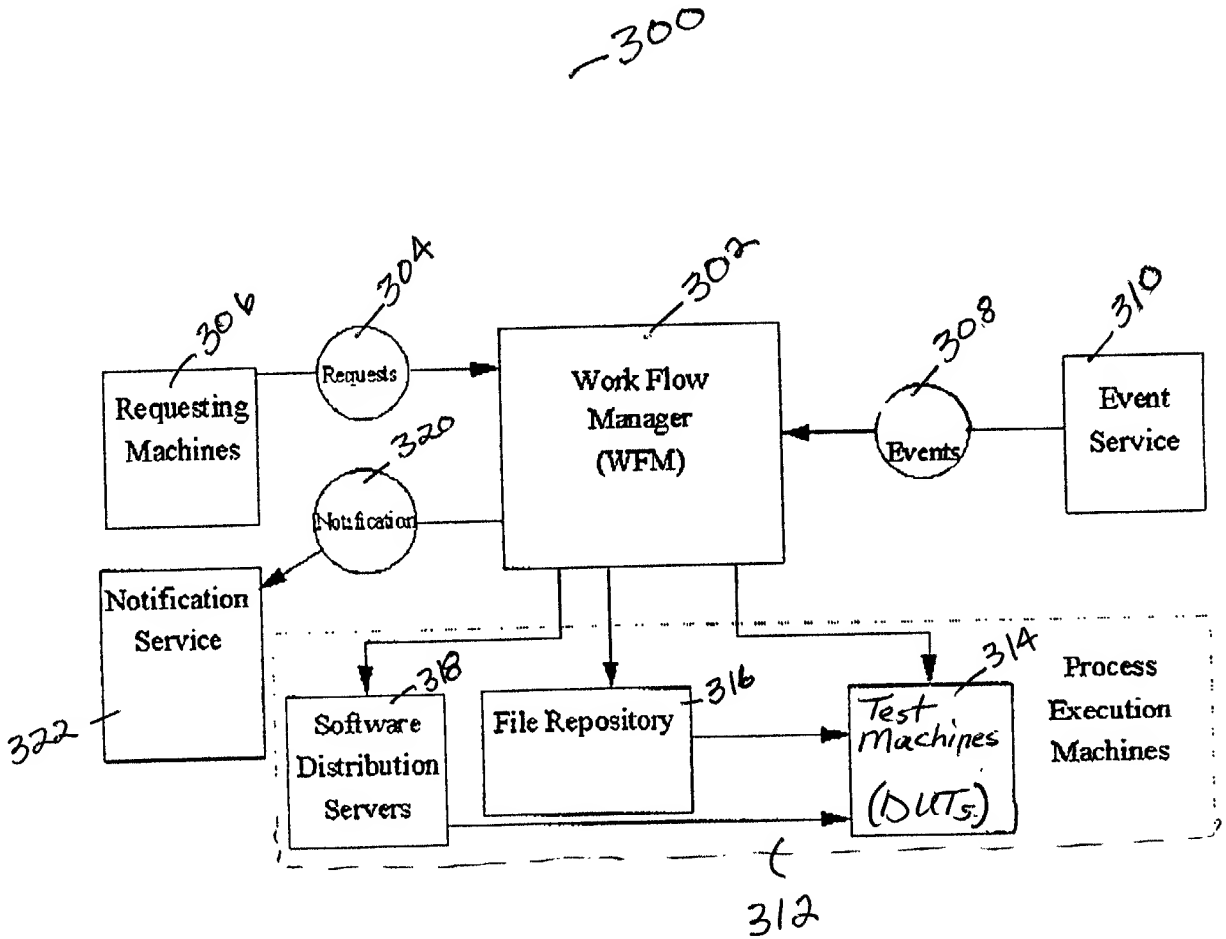

Fig. 3

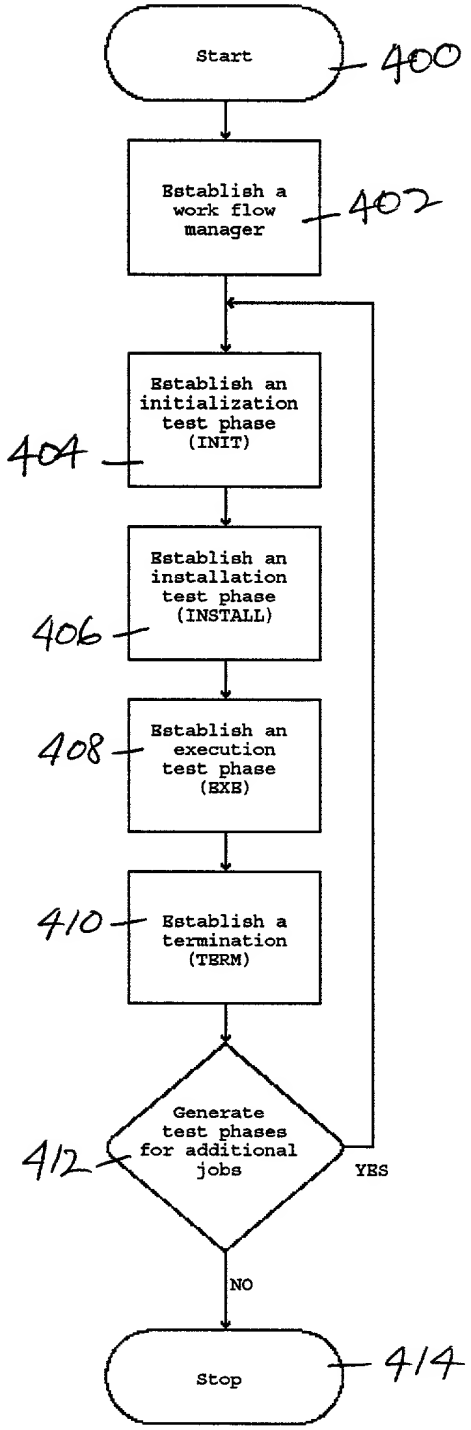
Start
400
Establish a work flow manager
402
Establish an initialization test phase (INIT)
404
Establish an installation test phase (INSTALL)
406
Establish an execution test phase (EXE)
408
Establish a termination (TERM)
410
Generate test phases for additional jobs
412
YES
NO
Stop
414

Fig. 4

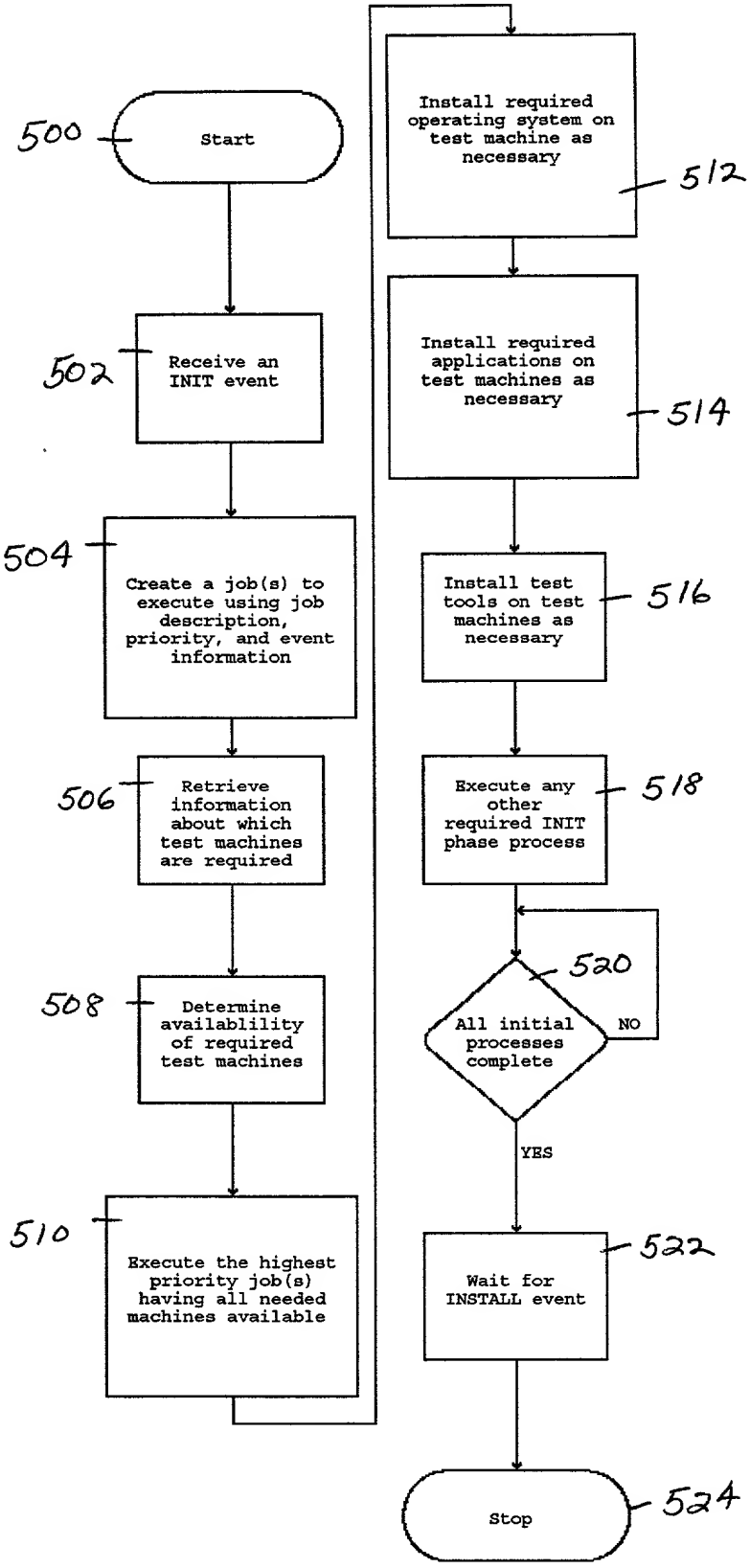

Fig. 5

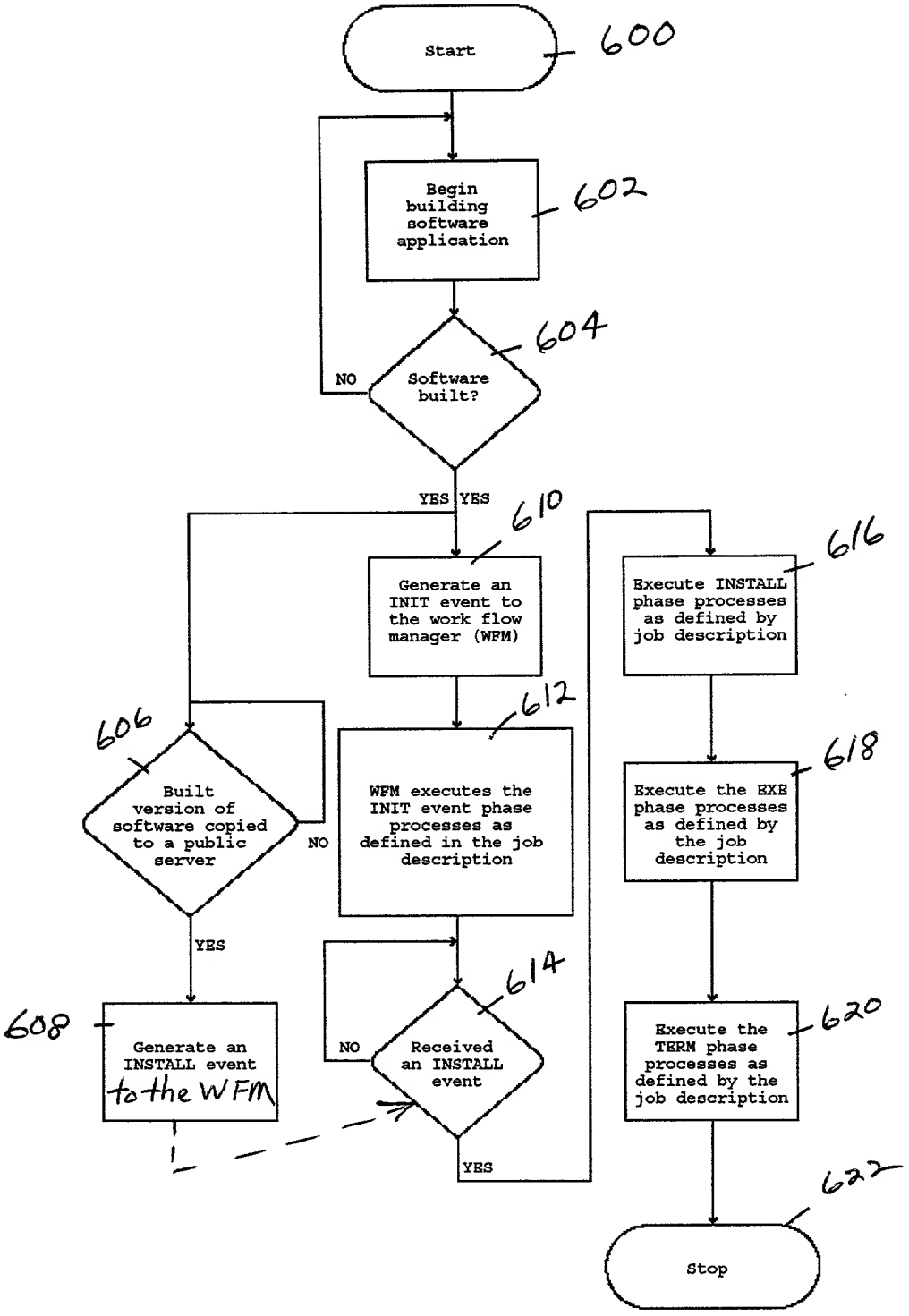

Fig. 6

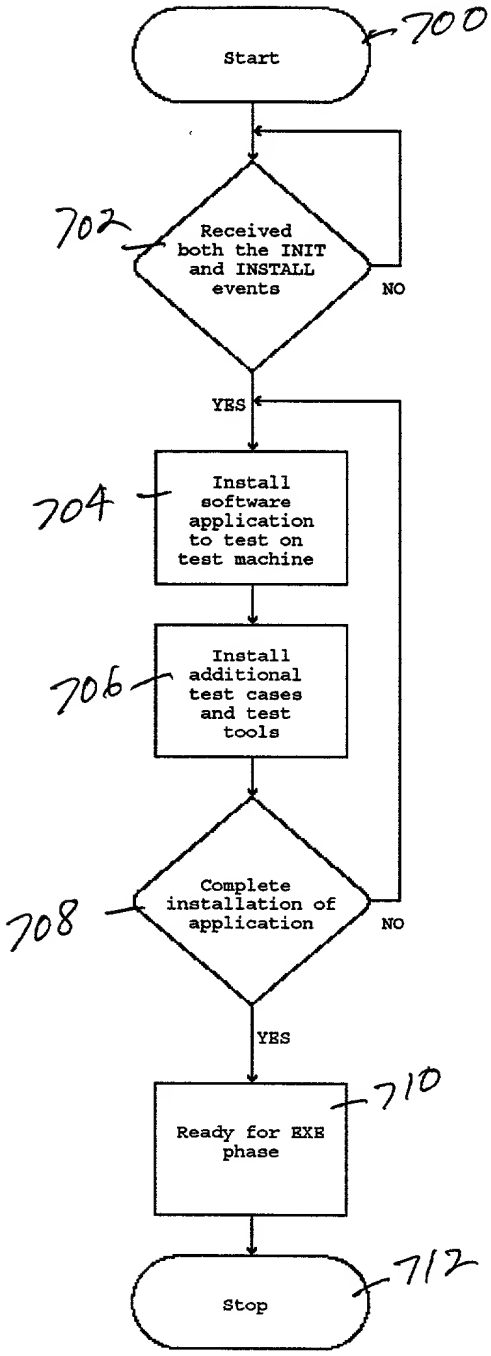

Fig. 7

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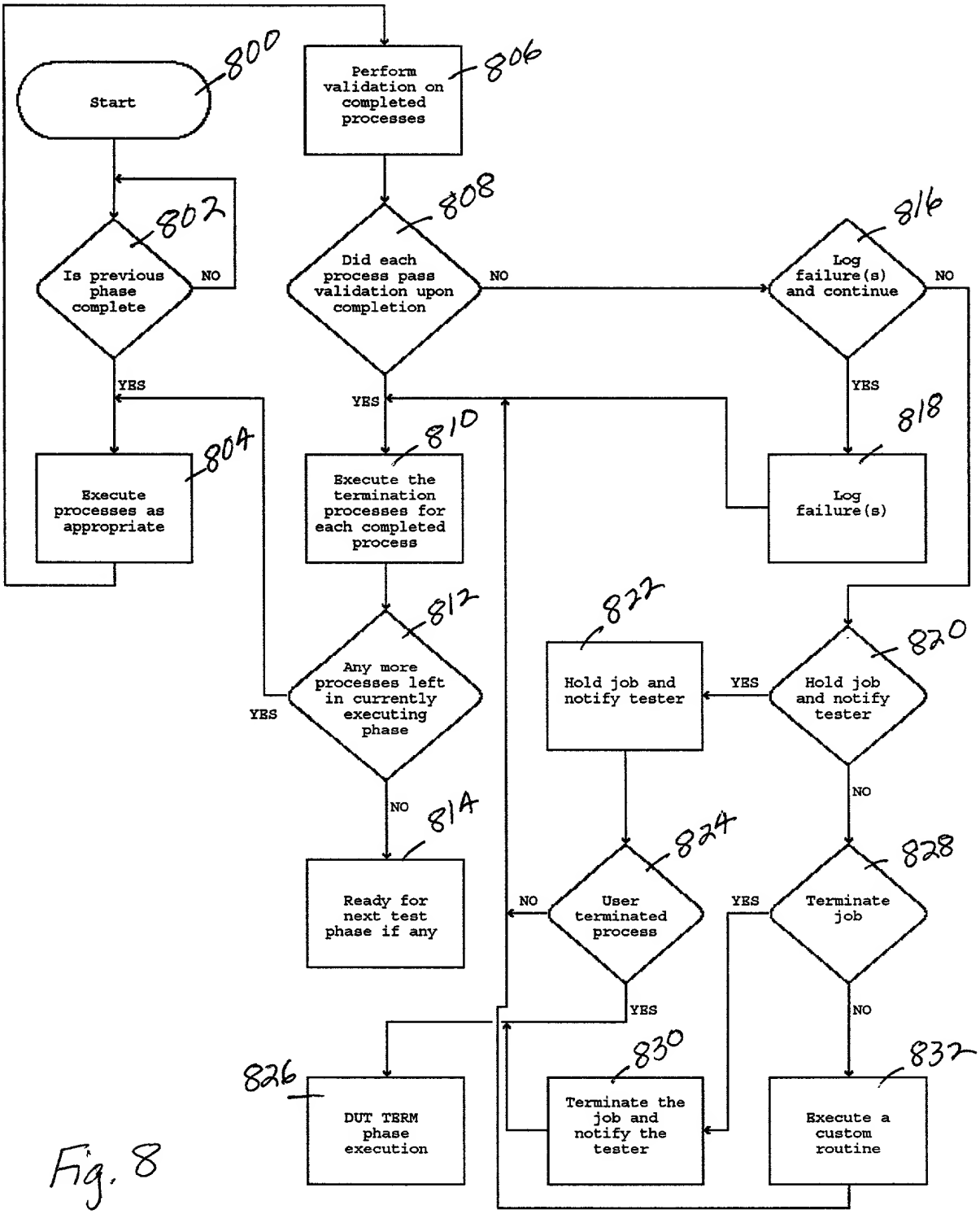

Start
800
Perform validation on completed processes
806
Is previous phase complete
802
NO
YES
Did each process pass validation upon completion
808
NO
YES
Log failure(s) and continue
816
NO
YES
Execute processes as appropriate
804
Execute the termination processes for each completed process
810
Log failure(s)
818
Any more processes left in currently executing phase
812
YES
NO
Hold job and notify tester
822
YES
Hold job and notify tester
820
NO
Ready for next test phase if any
814
User terminated process
824
NO
YES
Terminate job
828
YES
NO
DUT TERM phase execution
826
Terminate the job and notify the tester
830
Execute a custom routine
832

Fig. 8

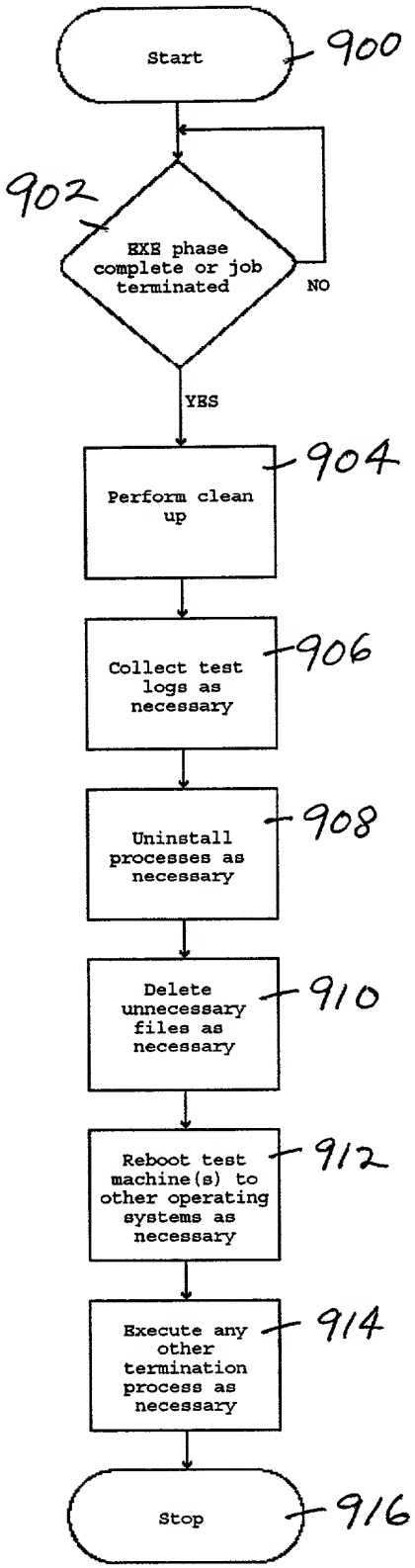

Start
900
902
EXE phase complete or job terminated
NO
YES
Perform clean up
904
Collect test logs as necessary
906
Uninstall processes as necessary
908
Delete unnecessary files as necessary
910
Reboot test machine(s) to other operating systems as necessary
912
Execute any other termination process as necessary
914
Stop
916

Fig. 9

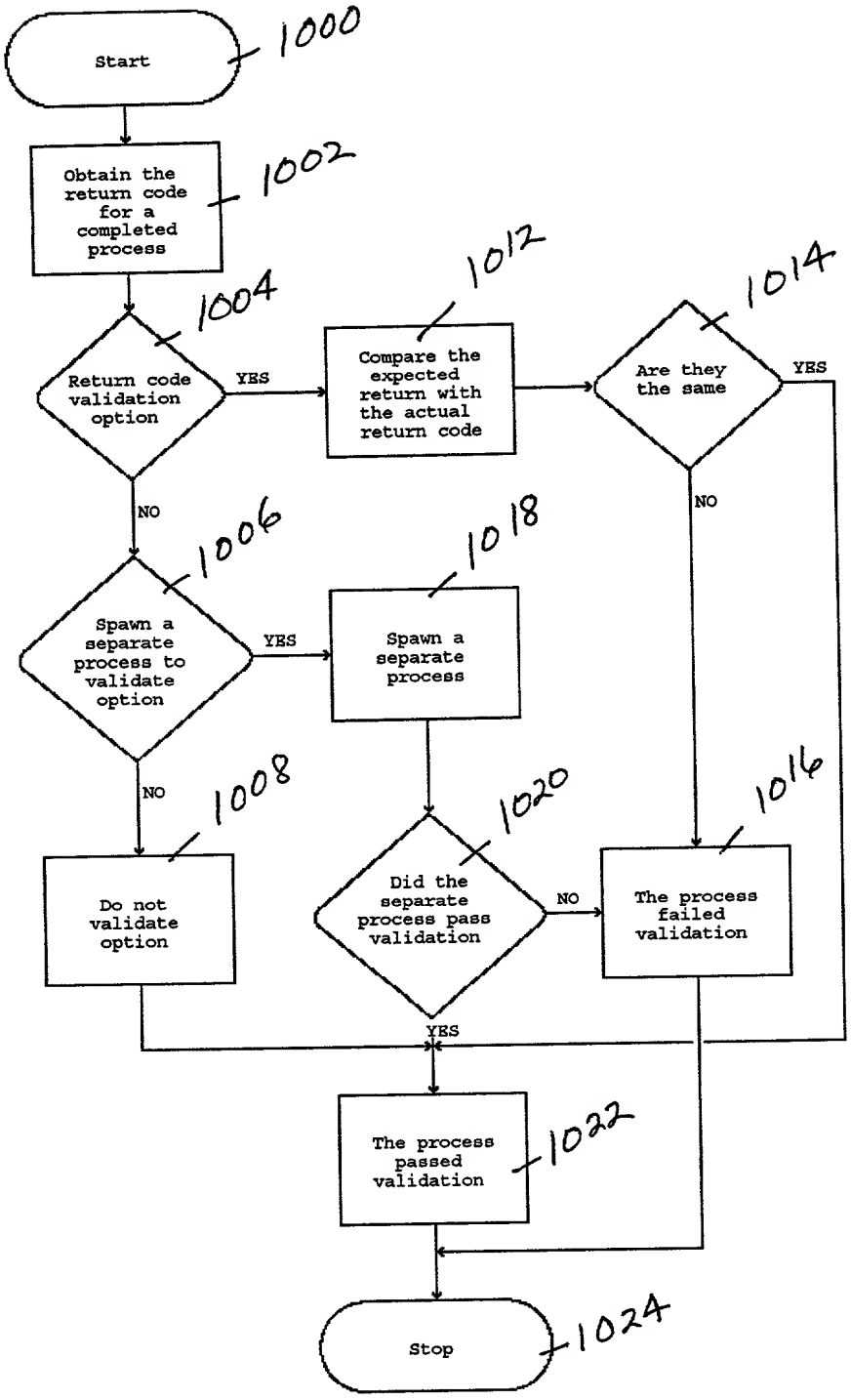
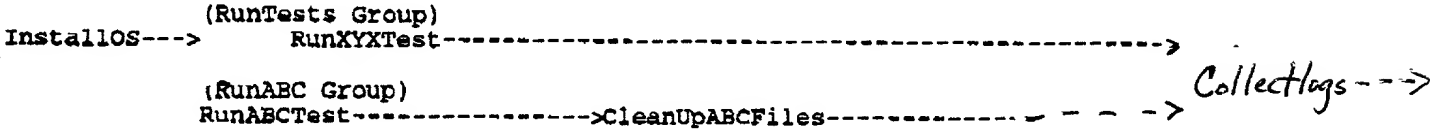

Start
1000
Obtain the return code for a completed process
1002
Return code validation option
1004
YES
Compare the expected return with the actual return code
1012
Are they the same
1014
YES
NO
Spawn a separate process to validate option
1006
YES
Spawn a separate process
1018
NO
Do not validate option
1008
Did the separate process pass validation
1020
NO
The process failed validation
1016
YES
The process passed validation
1022
Stop
1024

Fig. 10

```
PROCESS
     NAME Install0S
     COMMAND install.exe
     .... (other data) ...
END

PROCESS GROUP
     EXE PARALLEL
     NAME RunTests

     PROCESS
          NAME RunXYZTest
          COMMAND XYZ.exe
          .... (other data) ...
     END

     PROCESS GROUP
          EXE SERIES
          NAME RunABC

          PROCESS
               NAME RunABCTest
               COMMAND ABC.exe
               .... (other data) ...
          END

          PROCESS
               NAME CleanUpABCFiles
               COMMAND cleanABC.exe
               .... (other data) ...
          END
     END  /* end RunABC Group */

END    /* end RunTests Group */

PROCESS
     NAME CollectLogs
     COMMAND getLogs.exe
     .... (other data) ...
END
```

Fig, 11

EXECUTION TIME LINE



Fig, 12

DOCKET NUMBER: AUS000091US1

DECLARATION AND POWER OF ATTORNEY FOR

PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

DATA PROCESSING SYSTEM, METHOD, AND PROGRAM FOR AUTOMATICALLY TESTING SOFTWARE APPLICATIONS

the specification of which (check one)

X is attached hereto.

__ was filed on _____
as Application Serial No. _____
and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):			Priority Claimed
_____ (Number)	_____ (Country)	_____ (Day/Month/Year)	___ Yes___ No

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information material to the patentability of this application as defined in Title 37, Code of Federal Regulations, §1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

_____ (Application Serial #)	_____ (Filing Date)	_____ (Status)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorneys and/or agents to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

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